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ABSTRACT

Concerned with clarifying some of the more complex issues in drug abuse, the National Clearinghouse for Drug Abuse Information has prepared this special report on mescaline. Background information is provided through a summary of its history, legal status, and the opinions of authorities in the field. Significant research on the subject is presented together with major findings on various aspects of the problem. The pharmacology, chemistry, clinical effects (physiological, psychological, and behavioral), treatment, and patterns of use of the drug are dealt with. Bibliographic references are also listed. (BL)

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report series

NATIONAL CLEARINGHOUSE FOR DRUG ABUSE INFORMATION

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The National Clearinghouse for Drug Abuse Information recognized the need for clarifying some of the more complex issues in drug abuse by gathering the significant research on each subject and summarizing the major findings on various aspects of the problem. Report Series 11 through 18 deal with the pharmacology, chemistry, clinical effects, treatment and the patterns of use of each drug and provide a background in the area by outlining the history, legal status and the opinions of authorities in the field. These fact sheets were written and researched by the Student Association for the Study of Hallucinogens (STASH), Beloit, Wisconsin, under Contract No. HSM-42-71-26.

MESCALINE

Introduction and History

Mescaline is the primary active ingredient of the peyote cactus, Lophophora williamsii Lemaire, a plant which has been employed by Indians in northern Mexico from the earliest recorded time. History dates the drug's use to as far back as pre-Christian times, when it was used by the Chichimec tribe as an adjunct to religious-magical rites. By the time of the Spanish conquest, peyote had been adopted by a number of tribes who spanned the geographic distance from Central America to Texas, Arizona and Mexico.

In this setting, individuals used the mescaline-containing buttons to relieve fatigue and hunger and to treat victims of various diseases. The dried tops were worn as amulets for protection against danger. In tribal rites, mescaline was used in group settings to facilitate the achievement of the trance state necessary for tribal dances.

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Juan Cardenas apparently was the first European to experience the effects of mescaline and his treatise, Primera parte de los secretos maravilloses de las Indias, published in Mexico City in 1591 brought peyote to the attention of other scholars. By the year 1620, the use of the drug by Spaniards and black slaves came to the attention of the ruling authorities. In that year, the Mexican representatives of the Spanish Inquisition issued an edict banning all use of peyote. The edict, however, did not apply to the Indians, who were pagans and, therefore, outside the authority of the Holy Office.

In the nineteenth century, a number of tribes and tribal segments migrated north past the Rio Grande to Texas, New Mexico and Arizona. At the same time, a few northern tribes, including the Kiowas, launched raids against the south. Along with this mixing of Indian peoples came not only a diffusion of the practice of peyote use into what is currently the United States, but the institutionalization of peyotism in the form of organized cults. The activities of these cults culminated in the formation of the peyote church at the beginning of the twentieth century.

This institutionalization began in 1906 with a loose intertribal confederation known as the "Mescal Bean Eaters," which was formed in response to the white man's attempted suppression of peyote-taking. A form of accommodation to the direction of prevailing opinion was made in 1909 when the group changed its name to the "Union Church" and adopted some Christian elements into their rituals.

The year 1918, however, saw determined efforts on the part of the United States Bureau of Indian Affairs to induce Congress to pass anti-peyote legislation. As a defense measure, the Indians with the aid of a prominent Smithsonian ethnologist, James Mooney, incorporated the "Native American Church" in Oklahoma on October 10, 1918. In 1944, the Church changed its name to the "Native American Church of the United States" and amended its charter to allow it to take on a national role. When peyotism spread to Canada in 1955, the Church became the "Native American Church of North America."

Although several bills have been introduced over the years, the U.S. Congress has never passed a law prohibiting the Indians' religious use of peyote. Several states, however, have enacted anti-peyote legislation but these laws are either largely unenforced or have been ruled unconstitutional in the courts. In this regard, the legal action which has been most influential in setting precedents for the regulation of peyote was that written by the Honorable Yale McFate of the Superior Court of Coconino County in Flagstaff, Arizona:

> Peyote is not a narcotic. It is not habit-forming . . . . There are about 225,000 members of the organized church, known as the Native American Church, which adheres to this practice . . . . The use of peyote is essential to the

existence of the peyote religion. Without it, the practice of the religion would be effectively prevented . . . . It is significant that many states which formerly outlawed the use of peyote have abolished or amended their laws to permit its use for religious purposes. It is also significant that the Federal Government has in nowise prevented the use of peyote by Indians or others.

Interest in peyote on the part of non-Indians for other than religious reasons probably began in 1887 with the publication of an article by Dr. J. Briggs in the Medical Register, which described peyote as "in its action the most violent and rapid of all fruits, or even medicines known to me . . . . I think it well worth the trouble to investigate." Mr. Davis of the Parke-Davis Pharmaceutical Co. happened to read a reprint of Dr. Briggs' article and sent a letter requesting a supply of peyote buttons for laboratory analysis.

Two years later a tincture of Anhalonium Lewinii, Henning appeared in the Parke-Davis catalog along with indications for the use of the drug in the treatment of angina pectoris, pneumothorax, and as a depressant, respiratory stimulant, and cardiac tonic. The National Standard Dispensatory published in 1905 devoted an entire page to peyote and its tinctures, which were recommended as heart stimulants and respiratory stimulants. Another extract of peyote, "Le Peyotyl R.D." became somewhat popular in Europe as a general tonic of the nervous system.

In the laboratory, mescaline was first successfully isolated from the peyote plant in 1896 by A. Heffter, a German chemist. Twenty-three years later, E. Spath achieved the first complete synthesis of mescaline as 3,4,5-trimethoxyphenethylamine. Lewis Lewin, who had also worked on the chemical isolation of peyote's active principle, was one of the first to systematically outline mescaline's psychological, physiological and pharmacological properties.

Research interest in mescaline became somewhat dormant during the remainder of the twentieth century until 1940 when G. Tayleur Stockings presented the thesis that the drug produced a "controlled schizophrenic state." Stockings' proposition helped spark a research effort which attempted to relate biochemical changes induced by hallucinogenic drugs to biochemical changes in schizophrenia and other psychotic states.

After two or three decades, however, the "model psychosis" hypothesis lost currency in the research field as scientists came more and more to regard the effects of mescaline, LSD and similar drugs as somewhat distinct from the true psychotic state, and began to explore other avenues. Mescaline was one of the first hallucinogenic drugs employed in clinical trials for the purposes of treating alcoholism, neurosis and other disorders, a research thrust which still is embroiled in controversy.

Pharmacology

Mescaline belongs to the structural class of tetrahydroisoquinoline alkaloids; specifically it is a phenethylamine derivative. In this manner, mescaline differs structurally from LSD, psilocybin and other hallucinogenic drugs, all of which are indole compounds. Mescaline, however, is a close chemical relative of the hormone epinephrine (adrenaline) and the neurohormone norepinephrine (noradrenaline).

When taken orally, mescaline is readily absorbed by the intestinal tract and concentrates in the kidney, liver and spleen. In man, 60 to 90 percent of the administered dose is usually excreted in an unchanged form in the urine. The remainder of the dose is eliminated in the form of metabolites which are largely inactive.

Studies of the distribution of radioactive (Carbon-14) mescaline in the brains of cats indicate that the drug concentrates in cortical and subcortical grey matter. Recently George Aghajanian, Daniel X. Freedman and their colleagues have found a specific set of neurons in the brain which are very sensitive to LSD and mescaline. These brain cells comprise the raphe system which seems to regulate the production and turnover of serotonin in the brain. Serotonin is a brain chemical which is important in certain functions as a presumed transmitter substance.

While LSD uniformly inhibits all the raphe neurons, mescaline is effective on only a certain, non-random, portion of the complex. Mescaline seems to be most effective in the ventral portion of the dorsal raphe system. The selectivity of this site may, according to Aghajanian, account for the subtle differences seen between mescaline and LSD on autonomic functions and behavior.

Mescaline's action on other bodily systems has been extensively studied in both humans and lower animals, often with conflicting results. For example, in rabbits the drug produces a fall in heart rate or respiration. In man, however, mescaline elicits a syndrome of central sympathetic stimulation very similar to that seen with LSD or psilocybin. Pupil size is increased, pulse rate is also increased and blood pressure is elevated. Deep tendon reflex (e.g., knee jerk) thresholds are decreased by mescaline.

Hollister asserts that the mode of administration of mescaline (oral as opposed to intravenous or intraperitoneal injection) does not significantly affect the nature of the biochemical or behavioral reaction seen with identical doses. Smythies, on the other hand, contends that studies with rats show that orally administered mescaline (100 milligrams per kilogram) would not block the conditioned avoidance response (CAR), while intraperitoneal injection of only 25 mg./kg. effectively blocked the CAR.

Once mescaline is absorbed into the bloodstream, it has a half-life of about six hours in man. Peak blood levels are achieved in man about two hours following oral administration, which roughly corresponds to the level of highest intensity of psychedelic effect. Blood levels of the drug gradually fall off over the next ten hours, so that 24 hours after administration almost 87 percent of the dose is eliminated from the body.

Repeated doses of mescaline have been shown to produce tolerance to the drug's physiological, subjective and psychological effects in man, although in studies with rats, no tolerance could be found to mescaline-induced hypoglycemia and bradycardia. In man, a period of from three to six days is required for a high degree of tolerance to be established. At this time, a cross-tolerance between mescaline and LSD or mescaline and psilocybin has been demonstrated.

No known human deaths have been reported as a result of taking a lethal dose of mescaline. The LD_{50} of mescaline (the lethal dose required to kill 50 percent of the subjects to which it is administered) for rats receiving intraperitoneal injections is about 370 mg. of the drug per kg. of body weight. Certain drugs, such as insulin, barbiturates and physostigmine, are known to increase the toxicity of mescaline, and the dose of the drug which caused death when combined with insulin is close to the range of doses normally given to humans (500 to 1500 mg.). It is not inconceivable, therefore, that the presence of hyperinsulinism might result in the death of a person taking a large dose of mescaline.

Physiological addiction to mescaline has never been observed in studies of chronic administration or in longitudinal studies of Indians taking peyote. In this regard, mescaline is like LSD, psilocybin and most other hallucinogens; that is, tolerance develops rapidly but without the accompanying physiological dependence syndrome seen with opiates, barbiturates and alcohol.

Physiological Effects

The primary physiological effects of mescaline do not differ significantly from those of LSD: pupil dilation; increased deep tendon reflexes; increased systolic blood pressure and slightly increased body temperature are common to both drugs. Mescaline, however, has been shown to have somewhat different endocrinological effects. LSD, in doses of up to two micrograms per kilogram, did not affect excretion of epinephrine or norepinephrine in schizophrenics over an eight-hour period, while mescaline was shown to transiently decrease the excretion rates of both epinephrine and vanilmandelic acid over a four-hour period.

Other studies with schizophrenics indicate that mescaline has little or no effect on glucose metabolism, but it does decrease inorganic phosphate metabolism although the latter may be a nonspecific manifestation of stress. Free fatty acid mobilization, another concomitant of stress,

was found to be increased significantly more by mescaline than by a placebo. Such biochemical concomitants of physiological stress may, however, only reflect the anxiety produced by psychedelic drugs, rather than being good indicators of the drugs' mode of action.

A number of animal studies indicate that mescaline has some blocking effects on muscles and neuromuscular complexes. When applied locally, the drug causes depression of contraction in a transient manner (10 to 30 seconds). High doses of LSD have been found to antagonize mescaline's action on uterine muscle, but low concentrations of the former facilitate mescaline-induced contractions.

Psychological Effects

Of considerably greater interest than mescaline's pharmacological or physiological actions are the drug's subjective and psychological effects. In these latter two areas, however, generalizations are difficult to make, primarily because testing under even small doses of mescaline is hampered by poor subject motivation. Numerous reports have emphasized that when individuals in the peak of a psychedelic experience are requested to perform routine psychological tasks, they often regard the entire situation as absurd. While in the drug induced state, some mescalinized subjects have gone into prolonged convulsions of laughter when asked to put different shaped blocks into different shaped holes or to fill out symptom check-lists.

One of the best determinations of the psychological effects which are solely due to a psychedelic drug was made by Martin Katz and his colleagues at the National Institute of Mental Health. Although this study was conducted with small doses of LSD (50 micrograms), the findings are analagous to the psychological study of mescaline. Every effort was made to control for non-drug variables which might influence the nature of the LSD-produced psychological state. A significant finding of the study was that most subjects compiled a high ambivalence score on the Subjective Drug Effects Questionnaire. They felt unpleasant and happy at the same time; feelings of weakness and giddiness were often reported by the same subjects who had also experienced sober and serious sensations.

Because the physical and psychological syndrome produced by mescaline and other psychedelics, in toto, seems to be an ambivalent one, non-drug variables assume a high degree of importance in determining the eventual subjective reaction. Two non-drug variables which play the largest role, and have been the most extensively studied, are set and setting. Set refers to the psychological makeup of the subject who takes the drug; his personality, mood and expectations are all very important in determining what kind of reaction will develop. Setting refers to the physical, social and emotional environment in which the drug is administered. In this regard, it is very easy for a therapist or

researcher to produce a "psychotomimetic" (psychosis-mimicking) reaction or a "psychedelic" (mind-manifesting) reaction by the manipulation of the environmental conditions (such as the nature of the room, the nature of the objects and persons present in the room, etc.). When subjects are given mescaline in an austere hospital ward, with a white, antiseptic, sterile atmosphere by physicians or nurses who do little to comfort or support them, they may be more likely to experience adverse or stressful reactions to the drug. On the other hand, if well-prepared subjects are given mescaline in a warm, comfortable, familiar room, and in the presence of therapists whom they trust, the reaction will more likely be pleasant, or at least non-threatening.

In terms of traditional psychological measures, mescaline has been shown to impair complex discrimination tasks, immediate memory and problem solving. In short, it is reasonable to conclude that any minimally effective dose of mescaline will be associated with a transient impairment of intellectual functioning. However, care must be taken to recognize that these impairments may not be a direct drug effect of mescaline; but may be reflections of the total disinterest on the part of psychedelicalized subjects in performing psychological tests while they are in the drug state.

Another significant phenomenon produced by mescaline is a marked alteration in visual perception. Moderate doses raise the absolute visual threshold, the effect being more pronounced on photopic (central, bright color) than on scotopic (peripheral, dim, no color) thresholds. In the visual field, objects may take on new colors, shapes and may even seem to come alive while they shift, wave and ripple. Two dimensional drawings characteristically take on a three dimensional quality and senses often become mixed; people "see sounds," and "hear colors."

Most of these sensory alterations are more properly referred to as illusions or pseudohallucinations, rather than as true hallucinations. This is the case because mescalinized subjects are usually aware that the perceptual alterations are formed within their minds, have no basis in "reality," and are due to the effects of a drug. Hallucinations, as they are experienced by schizophrenics, for example, are regarded by them as reality in its true form, and not as the products of an abnormally functioning mind.

Subjective Effects

In the area of subject reactions, a multiplicity of symptoms are experienced following use of mescaline. Emotional lability, significant mood changes, and unprovoked emotional discharges are not uncommon. Introspective experiences are also reported by certain individuals:

> The sofa disappeared; I did not feel my physical self; an overincreasing feeling of dissolution set in. I was seized with passionate curiosity, great things were about to be

> unveiled before me. I would perceive the essence of things, the problems of creation would be unraveled. I was dematerialized.

Although subjects taking mescaline and other psychedelics may report an increased perception of truth, a noted psychiatric researcher, Dr. Daniel X. Freedman, has commented that they also evidence a "decreased desire to test out this truth in their lives."

Adverse, threatening reactions also may follow mescaline in both naive and experienced experimenters:

> Suddenly I found myself at the bottom of a black pit, clawing at the sides, attempting to escape. Leering into the pit was Satan, an evil-looking creature with the head of a demon and the body of a spider. He was sneering at me and uttering words, "Alone! Alone! Alone!" The words echoed throughout the pit like a curse, an affliction from which I could not escape . . . There was no one with whom to share my plight; I was alone in the pit. I sensed that hell, after all, is lack of contact with other people.

Treatment

"Bad trips" on mescaline can usually be reversed or ended by a competent therapist or supportive friend through the process of "talking down." This technique involves a minimum of physical or medical intervention and emphasizes providing comfort, support and reassurance that a "bad trip" can be turned into a "good trip," or at the very least, that a bad trip is a useful learning experience. Although chemical intervention (primarily with phenothiazine tranquilizers) has been widely practiced by emergency wards in the past, it is usually not necessary except as a last resort. Complications with chemotherapy of adverse mescaline reactions include: creation of a more confusing picture, which is harder for the physician to diagnose and treat; paradoxical responses, in which the treatment may make the trip worse rather than better; interference with normal breathing patterns; and, idiosyncratic combinations of drugs which can cause shock and even death. The latter possibilities should be taken into strong consideration when the bad tripper has taken "synthetic" or "extracted" mescaline procured from illicit sources because, as will be shown later, these "drugs" in all likelihood are not real mescaline, but combinations of any variety of psychopharmaceuticals (including phencyclidine, atropine, etc.).

The incidence of illicit mescaline use on the street has never been accurately determined. The drug, in the form of peyote buttons, was available for personal experimentation from the beginning of this century, but it did not gain much of a following until the 1950's. At that time a number of "beats," poets, artists and students began trying peyote as a supplement to their use of other drugs.

It is not unreasonable to hypothesize that the incidence of both natural and synthetic mescaline use increased dramatically during the years 1967-1970 when the nation-wide concern over LSD-induced chromosomal damage led may users to substitute other psychochemicals for LSD. Now that an awareness of the unresolved nature of LSD's genetic effects is spreading, however, more students are probably returning to the cheaper and more readily available "street acid."

The primary problem in determining the nature and extent of illicit mescaline use, however, is the fact that studies of street drugs have revealed a marked inconsistency with respect to what is purportedly in a particular capsule or tablet and what it really contains. For example, a team from Toronto's Addiction Research Center Foundation found that none of the 23 pills it purchased on the street under the name of "mescaline" actually contained even the slightest amount of the drug. Frances Cheek of the New Jersey Neuro-Psychiatric Institute, who surveyed the nature of street drugs on the East Coast for a period of three years, also found that none of the illicit "mescaline" samples she obtained contained pure mescaline. A number of street drugs sold as mescaline, psilocybin, or even LSD, contain amphetamines, STP (DOM), belladonna alkaloids, phencyclidine (PCP) and other contaminants, many of which have been improperly synthesized.

Legal Aspects

Both mescaline and peyote are listed as Schedule I(c) restricted substances in the "Comprehensive Drug Abuse Prevention and Control Act of 1970," (Public Law 91-513). As such they are treated in the same manner as are LSD, STP (DOM), marihuana, psilocybin and other hallucinogens. The religious use of peyote by Indian members of the Native American Church, however, is not specifically prohibited by federal law.

Under this law, the manufacture, production, creation or distribution of mescaline or peyote are punishable by a prison sentence of not more than five years and/or a fine or not more than $15,000. A second offense can bring a doubling of the above penalties. Any sentence imposed for these violations, in the absence of a prior conviction, however, shall be accompanied by a special parole term of at least two years in addition to the term of imprisonment and shall, if there was such a prior conviction, impose a special parole term of at least four years in addition to such term of imprisonment.

Simple possesion of small amounts of mescaline or peyote for personal use in punishable by a term of imprisonment of not more than one year and/or a fine of not more than $5,000. A person who has had no prior drug convictions, however, may qualify, upon entering a plea of guilty, for a special probation period of not longer than one year. Discharge and dismissal under this section shall be without court adjudication of guilt, but a nonpublic record thereof shall be retained by the Department of Justice solely for the purpose of use by the courts in determining whether or not, in subsequent proceedings, such person would qualify for parole.

Issues and Opinions

As can be seen from the following excerpts, the way mescaline is regarded by experts often depends upon how, by whom and in what situation the drug is employed. Almost all agree that mescaline's effects are virtually identical to those of LSD, but the way responsible Indians employ peyote suggests that others may have a great deal to learn about the socio-cultural aspects of psychedelic drug use.

> Mescalito (peyote) is a protector, a kind, gentle protector; but that does not mean you can make fun of him. Because he is a kind protector he can also be horror itself with those he does not like . . . As I have already told you, he is not the same for everyone.
>
> --Carlos Castaneda

> Such consequential effect of management is illustrated by the example of the Native American Church, a group of Indians which has employed peyote (a mescaline-containing cactus) for years as a religious sacrament. These people take the drug in a family setting with a few leaders. They have seen "bad trips" and are quite adept at handling this consequence of peyote use. They suggest that the individual on a bad trip is not "in the mind of God," that he is being competitive and conflictual. They help him out of his experience by suggesting that he ignore the TV show in his head and concentrate on "higher" things. In fact, the Indians strive to have totally non-visual and non-hallucinatory "psychedelic" experiences because these visual tricks are seen as mere distractions from the real lesson that peyote is striving to communicate. The Indians' different method of managing the peyote experience yields outcomes that are radically different from those seen among the middle-class, white generation now using these drugs. Peyote is a pillar of their way of life and its use leads an individual to the acceptance of the status quo: A family that gets stoned together (on peyote) stays together!
>
> --Daniel X. Freedman

> The modern churches, with some exceptions among the Protestant denominations, tolerate alcohol . . . but, drinking cannot be sacramentalized except in religions which set no store on decorum. The rites of Christianity are incompatible with even religious drunkenness. This does no harm to the distillers, but is very bad for Christianity. Countless persons desire self-transcendence and would be glad to find it in church . . . They take part in rites, they listen to sermons, they repeat prayers; but their thirst remains unassauged. Disappointed, they turn to the bottle . . . We see, then, that Christianity and alcohol do not and cannot mix. Christianity and mescaline seem to be much more compatible. This has been demonstrated by many tribes of Indians, from Texas to as far north as Wisconsin.
>
> --Aldous Huxley

Contemporary Indians continue to use the drug for healing. Schultes says Plains Indians use it as freely as Caucasians use aspirin, that rural Mexicans employ it as a household analgesic. It has also been used as a cure for drug dependency or toxic reactions--for example, in the treatment of opium dependency, alcohol hangovers, and alcoholism. Safford cites the claim of peyote cultists that cult members lost all interest in alcohol once initiated. Aberle observes that there is an anti-alcohol morality which is part of the peyote religion; as a result, many teetotalers are found among the cultists.

--Richard H. Blum

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